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THE RENIFORM NEMATODE

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The reniform nematode, Rotylenchulus reniformis Linford & Oliveira 1940, is a severe pathogen of cotton, soybeans, pineapples, and sweet potatoes. It is known to parasitize approximately 160 other plants. It was first observed on the roots of cowpea, Vigna unguiculata (L.) Walp., in the Hawaiian Islands. The reniform nematode was described as a new species in 1940 after 4 years of investigations. The name "reniform" refers to the distinct kidney-shaped appearance of the mature female.

HOSTS:

The reniform nematode is of considerable economic importance. It is distributed around the world and is found in the southern United States. It is one of the most common nematodes found in areas under cultivation in tropical America. It has a lengthy host range which includes many dicots but few monocots. Some of the economically important host plants are:

Banana - Musa x paradisiaca L.
Cabbage - Brassica oleracea L. (Capitata group)
Cantaloupe - Cucumis melo L.
Cassava - Manihot esculenta Crantz
Citrus - Citrus x limonia Osbeck
" - C. maxima (Burm.) Merr.
" - C. sinensis L. Osbeck
Coconut - Cocos nucifera L.
Cotton - Gossypium hirsutum L.
Cowpea - Vigna unguiculata (L.) Walp. (V. sinensis Endl.)
Clover, crimson - Trifolium incarnatum L.
Eggplant - Solanum melongena L.
Guava - Psidium guajava L.
Kale - Brassica oleracea L. (Acephala group)
Lettuce - Lactuca sativa L.
Mango - Mangifera indica L.
Okra - Hibiscus esculentus L.
Pigeon pea - Cajanus cajan (L.) Huth
Pineapple - Ananas comosus (L.) Merr.
Pumpkin - Cucurbita moschata (Duchesne) Poir.
Radish - Raphanus sativus L.
Soybean - Glycine max (L.) Merr.
Sweet potato - Ipomoea batatas (L.) Lam.
Tobacco - Nicotiana tabacum L.
Tomato - Lycopersicon esculentum Mill.

The following plants have been reported as showing immunity or resistance to the reniform nematode:

Barley, wild - Hordeum pusillum Nutt.
Grass, barnyard - Echinochloa crus-galli (L) Beuv.
Grass, pangola - Digitaria decumbens Stent.
Mustard - Brassica nigra (L.) W. D. J. Koch 'Evergreen'
Oats - Avena sativa L. 'Fulghum'
Pepper, red-hot - Capsicum annuum L.
Pepper, sweet - Capsicum annuum L.
Sorghum, sweet - Sorghum bicolor (L.) Moench. (S. vulgare Pers.)
Spinach - Spinacia oleracea L. 'Bloomsdale'
Sugarcane - Saccharum officinarum L. 'C. P. 44-101'

SYMPTOMS AND DAMAGE:

Roots are infected only by young females. Other plant parasitic nematodes become infective during the 2nd larval stage. A general review of the literature indicates that reniform larvae normally do not feed.

The young female enters the root headfirst causing browning and necrosis of damaged cells. She feeds on the phloem cells after puncturing them with her stylet. The phloem cells enlarge 4-6 times their normal size and extend 10-12 cells in all directions from the feeding site. The enlarged phloem cells are not commonly multinucleate nor as large as the giant cells associated with host responses to the feeding of root-knot or cyst nematodes.

In cotton, necrosis of root tissues causes premature decay resulting in dead or unhealthy and stunted plants. Cotton seedlings may harbor as many as 900 egg masses per plant. Reniform nematodes also are associated with incidences of Fusarium wilt as high as 81.4% in wilt susceptible varieties of cotton compared to 10% where reniform nematodes are not present in the soil.

LIFE CYCLE:

The life cycle requires 17-29 days for completion from egg to egg. After the female has deposited her eggs, the developing larvae molt once while still inside the eggs. After hatching, they molt 3 more times to become young adult males or females.

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The young females penetrate into the roots about one-third of their body lengths. Some may become completely embedded. The female body enlarges, and approximately 100 eggs are deposited into a transparent quick-hardening substance called the matrix. The matrix is secreted from cells on either side of the vaginal canal during the egg-laying process. Mating males sometimes get caught in the matrix.

BRIEF DESCRIPTION OF GROSS CHARACTERISTICS:

Males, females, and larvae all have: 1) esophageal glands overlapping the intestine; 2) the dorsal gland orifice a distance greater than 1/2 the stylet length posterior to the stylet knobs; and 3) heavily sclerotized lip structures.

The mature female has a swollen kidney-shaped body containing 2 ovaries. Length is 0.38-0.44 mm. Width at vulva is 0.10-0.14 mm. Vulva is located 68- 78% of the body length from the head. Stylet and knobs are distinct.

The immature female is eelworm-shaped with 2 ovaries. Length is 0.34-0.42 mm. Vulva is located 68-73% of the body length from the head. Stylet and knobs are distinct.

The male is eelworm-shaped. Length is 0.34-0.42 mm. Stylet and knobs are reduced. Caudal alae are rudimentary.

IMPORTANCE TO AGRICULTURE:

The reniform nematode has demonstrated that it can adapt and become an aggressively reproducing parasite after 12 generations exposure to an unfavorable host. It is hardy enough to survive in large numbers over long periods of time in fallow soil. Investigations reveal that it can live 6-7 months in stored dry soil. It is a pest with the potential for causing serious damage to economic crops.

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